

REMARKS

Reconsideration of this application is respectfully requested. Claims 1-18 are pending and under consideration. No amendments have been made. No new matter has been added by way of this response.

Obviousness Rejections

Claims 1-6, 10-12, and 16-18 have been rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,383,458 ("Brierley") in view of MacLeod, et al., *Applied and Env. Microb.*, 54(6):1365-1372 (June 1988) ("MacLeod"). The Examiner asserts that Brierley teaches a method of recovering metal from ore by adding microorganisms to a heap, and MacLeod discloses that carbon-starved ultramicrobacteria ("UMB") that lack exopolymers penetrate deeper into heap cores than do vegetative bacteria which maintain an exopolymer. The Examiner further asserts that the proviso of claim 1, "wherein the activated microorganisms accelerate the dissolution of minerals by oxidation reactions," is deemed inherent by the mere use of microorganisms (*see* Office Action, page 7).

Applicants traverse this rejection and respectfully request reconsideration.

To reject a claim for obviousness under U.S. law, the Examiner must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art. Additionally, the Patent Office must articulate the reason(s) why a skilled artisan would have recognized that the results of combining the cited prior art would have yielded "nothing more than predictable results" (*see* Examination Guidelines, Department of Commerce, *Federal Register*, 72(195):57529 (October 10, 2007)).

Additionally, for a claim to be obvious, the prior art reference(s) must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, (Fed. Cir. 1983). Therefore, the references, either alone or in combination, should not teach away from the

claimed invention. Applicants submit that for at least the following reasons, these requirement to establish obviousness have not been satisfied.

As previously noted, MacLeod relates to the methods of using bacteria in the mining of oil from sandstone. Bacteria are used to plug sandstone formations to control the depth to which water injections sweep through the sandstone to remove oil. Specifically, MacLeod makes use of the relative difference in size between bacteria and UMB to selectively plug sandstone cores. The former have a size of about 2 to 3 microns, the latter have a size of less than 0.3 microns. Thus, UMB are about 10% the size of bacteria. According to MacLeod, it is this size differential that allows UMB to penetrate deeper into the sandstone formations than bacteria, thereby improving plugging action. The methods disclosed in MacLeod, in short, involve an unrelated art and would not be relied upon by a person of ordinary skill in the claimed art.

The present claims call for a heap leaching process wherein bacteria are starved the point where they only lose their exopolymers, and are then reactivated so that they enhance oxidation reactions to improve heap leaching. In the present invention, the exopolymer-less bacteria are irrigated onto the heap along with nutrients which allow them to regenerate exopolymers. The bacteria adhere to rocks because of their sticky exopolymers, not because of their size. In other words, physical plugging is not involved. MacLeod does not teach or suggest reactivating the production of exopolymers on the external cells walls of the microorganisms in order to form activated microorganisms that accelerate the dissolution of minerals in a heap leaching pile by enhancing oxidation reactions. Rather, the object of MacLeod is to plug a sandstone core structure, which is the opposite from the object of the claimed invention, i.e., to spread bacteria evenly throughout a heap.

Therefore, a person skilled in the art would not look to the techniques disclosed by MacLeod, which relate to a different art, to arrive at the claimed invention. A skilled artisan would realize that the characteristics of the low-permeability sandstone oil formations are so dissimilar to those of a high permeability heap formed from crushed rock that the techniques disclosed by MacLeod could not be successfully applied in heap leaching to improve oxidation

reactions. Also, a person skilled in the art would not have predicted that MacLeod's technique would improve (or even result in) heap leaching. Instead, the skilled artisan would predict that the methods disclosed in MacLeod would be counterproductive to heap leaching because of the plugging nature of MacLeod's method. Thus, the present invention is not obvious in view of MacLeod because MacLeod does not disclose or suggest improved heap leaching by the activation of bacteria within a heap, wherein the activated microorganisms accelerate the dissolution of minerals by oxidation reactions. In short, MacLeod is not applicable to the claimed invention, nor would it be recognized as such by a person of ordinary skill in the art.

Brierley does not disclose or suggest the reactivation of bacteria to form activated microorganisms that accelerate the dissolution of minerals by oxidation reactions, and does not cure the deficiencies of MacLeod.

Additionally, "to establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is *necessarily present* in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency may not be established by probabilities or *possibilities*. The mere fact that a certain thing *may result* from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745, (Fed. Cir. 1999) (emphasis added).

Applicants submit that, in contrast to the Examiner's position, the proviso "wherein the activated microorganisms accelerate the dissolution of minerals by oxidation reactions" is not an advantage that would "flow naturally" from following the suggestion of the prior art. The characteristics of the low-permeability sandstone formations (as disclosed in the cited art) are so dissimilar to those of a high permeability heap formed from crushed rock for heap leaching that a skilled artisan would not have recognized (or predicted) that MacLeod's techniques would necessarily result in accelerated oxidation reactions to improve oxidation reactions, as claimed. In other words, the environment (structure, content, etc.) of low-permeability sandstone oil formations (MacLeod) is notably different than the environment of bio-assisted heaps, and thus,

it cannot be assumed that the claimed method would *necessarily* accelerate oxidation. Accordingly, the proviso provides a limitation that is not “inherent” in view of the cited art.

In view of the foregoing, the cited references, either alone or in combination, would not have led a person of ordinary skill in the art to arrive at the claimed invention. Therefore, Applicants respectfully request that this rejection be withdrawn.

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Claims 7-9 and 13-15 have been rejected under 35 U.S.C. § 103(a) as obvious over Brierley in view of Macleod, and further in view of U.S. Pat. No. 6,435,769 (“Harrington”). According to the Examiner, Harrington teaches a process for treating heaps with nutrients either before or after a rock heap is formed, including the addition of slow release components.

Claim 1 recites a method of introducing microorganisms into a heap of material for bio-assisted heap leaching, wherein activated microorganisms accelerate the dissolution of minerals by oxidation reactions. As described in the specification, microorganisms act as catalysts in the oxidation reactions that accelerate the dissolution of minerals (*see* published specification, ¶3). Improved dissolution is advantageous because it improves the leaching process, i.e., improves the output of the heap.

In contrast, Harrington discloses a method of treating heaps to “prevent acid drainage” and to *displace* oxygen, thereby *reducing* oxidation reactions. Harrington states that oxygen reduction should be enough “to prevent oxidative reactions that cause acid *and soluble metal formation*” (*see* Harrington, col. 1, lines 60-67) (emphasis added). In contrast, the object of the claimed invention is to promote oxidation, solubilization, and extraction by improving oxidative reactions within a heap (*see* claim 1, step c). Although Harrington discloses methods of treating heaps, the object of Harrington (i.e., minimizing metal ionization and leaching by *reducing* oxidation) is the opposite of the instant invention, i.e., *improving* oxidative reactions and solubilizing metals.

Therefore, Harrington expressly teaches away from enhancing dissolution of minerals by oxidation reactions in a heap, and as noted above, it is improper to combine references where their combination teaches away from the claimed invention (Manual of Patent Examining Procedure § 2145). A skilled artisan would not have been motivated to combine, or have a reasonable expectation of success in combining, the teachings of all three references to arrive at the present invention because Harrington discloses decreasing oxidation in a heap, whereas the claimed invention augments oxidation and hence dissolution. Finally, in view of Harrington, a person of ordinary skill in the art would not predict that reducing oxidative reactions within a heap, as disclosed in Harrington, would lead to assisted heap leaching, as presently claimed. *See KSR v. Teleflex*, 550 U.S. ____ (2007) (a combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results).

The Examiner states that it is improper to attack references individually where the rejections are based on the combination of references (*see* Office Action, page 4). Applicants respectfully submit that this premise is not applicable when one or more of the references (e.g., Harrington) expressly teaches away from the claimed method, and thus, combining the cited prior art would have been counterintuitive to a person of ordinary skill in the art.

For the foregoing reasons, the invention called for in the present claims is not obvious in view of the cited references. Applicants respectfully request that this rejection be withdrawn, accordingly.

Conclusion

In view of the above remarks, it is respectfully requested that the application be reconsidered and that all pending claims be allowed and the case passed to issue.

If there are any other issues remaining that the Examiner believes can be resolved through either a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned representative at the telephone number indicated below.

Dated: July 9, 2008

Respectfully submitted,

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